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COMPARISON OF INJECTION AND FLOAT TYPE AIRCRAFT CARBURETORS

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Your future, your freedom, in fact, your very life depends on a single mechanism that is proving its worth daily in the defense of all that stands for freedom. This mechanism is the injection aircraft carburetor. Compared to the float type, the injection aircraft carburetor provides all the necessary improvements lacking in the float type. These advances in design enable our ponderous "Flying Fortresses" to fly at amazing altitudes. Today, as never before, the need for this improved mechanism is vital; for without the injection carburetor, it would be impossible to bomb the nerve centers of our enemies. In short, the progress of carburetion has allowed our military aircraft to become effective.

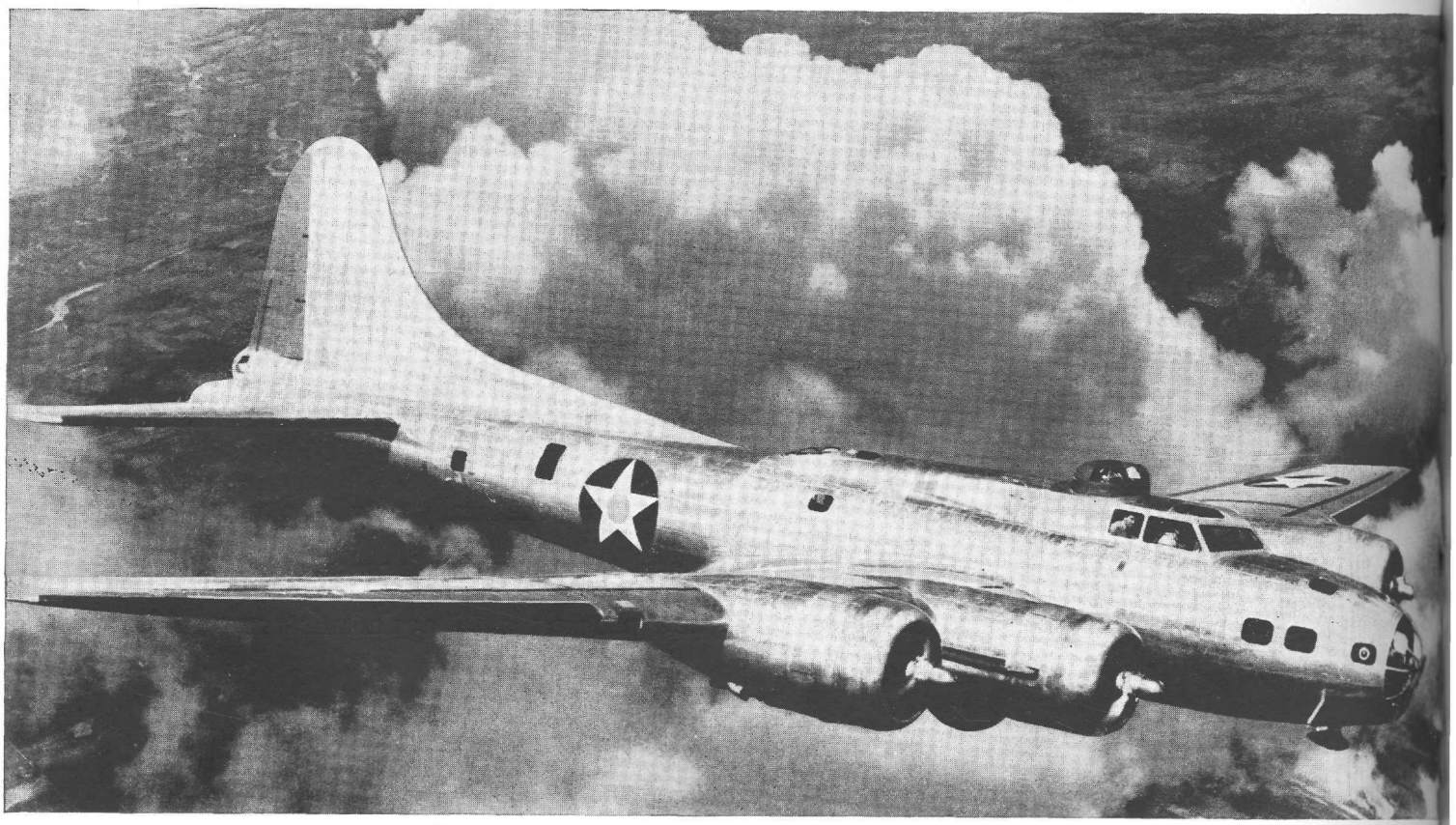
The carburetor measures the correct quantity of fuel to be supplied to the engine, atomizing and mixing the fuel with air. Due to the difference in weight between fuel and air, and the changing pressures to which they are subjected, the problem of maintaining correct mixture proportions is very difficult.

The injection carburetor overcomes the problem of maintaining correct mixture proportions by the use of venturi tubes to control the air flow. The air flows through the boost (large) venturi from the air scoop. This air is passed over the impact tubes to measure and control the proportions to be made later.

It should be pointed out that no fuel is discharged into the venturi section of the injection carburetor. The flow capacity of a venturi is greater when only air flows through it. Therefore, the injection type can supply more fuel per second than is possible with the float type.

The impact tubes supply the air scoop pressure, and the boost venturi supplies the suction pressure. These pressures are directed to a device called the air diaphragm, which measures the differential pressure to a correct force. The force is then applied to the fuel valve when fuel is needed.

Occasionally, the need arises for a more detailed check on the air flow, and this is the job of the automatic mixture control unit. This mechanism consists of sealed metallic bellows which operate a contoured valve. The bellows are filled with a measured amount of an inert gas (nitrogen) to



GIANT FLYING FORTRESS —*Courtesy General*

sensitize the carburetor to temperature, as well as the pressure changes of the mass air flow. Thus, a complete and accurate check is kept on the amount of air allowed to mix with the discharged fuel.

The method of controlling air flow by the float carburetor is somewhat efficient, but crude in comparison to the injection type. The most important control is the butterfly valve, or throttle, as it is sometimes called. This throttle is located in the carburetor venturi and provides a means of controlling engine speed by regulating the air flow in the venturi. The only control of mixture proportions by this method is the air bleed which supplies more or less air to the fuel as needed. This system is poor because at different altitudes the carburetor will operate with varying degrees of efficiency.

Injection carburetion solves the problem of controlling the fuel flow in ratio to the demands of the engine. The fuel control section of this carburetor operates in conjunction with the air section, thus insuring a balanced mixture.

The fuel control section consists of a fuel diaphragm similar to the air diaphragm, fuel jets, and discharge nozzles. The fuel diaphragm is connected to the air diaphragm by a balanced poppet valve. When the air pressure increases, the air diaphragm moves, opening the poppett valve in the fuel diaphragm.

The impact pressure from the air diaphragm to the fuel diaphragm controls the density of the fuel charge. The suction pressure controls the amount of fuel that the fuel diaphragm allows to flow to the metering jets and discharge nozzle. This method is the most efficient in aircraft carburetion because it assures correct mixture of fuel and air. The valves act independent of the float and allow more fuel when needed, or hold back fuel when necessary. The float carburetor would be impracticable for aircraft use without the needle valves, because they provide the needed precise control of fuel.

The air bleed of the float carburetor corresponds to the air diaphragm of the injection type. The air bleed reduces the air pressure in the float chamber, thus reducing the amount of fuel flowing to the engine. This is necessary in high altitude flying.

At the present time, the injection carburetor appears to be the only aircraft carburetor that can produce a steady flow of fuel and still maintain perfect mixture proportions. This carburetor mixes five tons of air to an amazing degree of perfection during a single hour of engine operation. The density of the air continually changes, but the injection carburetor is so cleverly constructed that it will function perfectly at all altitudes.

The float type carburetor produces a mixture of fuel and air, but this mixture is only approximate in its approximate proportions. This carburetor is erratic because the float is subject to gravity. If the airplane maneuvers violently, the float chamber will be rendered useless, and operation will be poor or fail entirely.

Injection carburetion is a symbol of progress in the field of carburetion. This carburetor will advance aeronautics to the period when men shall fly as high, as far and as fast as he desires. The fulfillment of this dream will be a worthy task for such a magnificent mechanism.
